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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,675	10/10/2006	Edward John Anthony	5519.P0001US	9665

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EXAMINER
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MASHRUWALA, NIKHIL P

ART UNIT	PAPER NUMBER
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3749

MAIL DATE	DELIVERY MODE
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07/25/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/554,675	<b>Applicant(s)</b> ANTHONY ET AL.	
	<b>Examiner</b> NIKHIL MASHRUWALA	<b>Art Unit</b> 3749	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>10/26/2005</u> . | 6) <input type="checkbox"/> Other: ____.  |

### DETAILED ACTION

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent no 5,662,051 of Morin in views of EP 118770A1 of Tencati Claudio, WO 94/21965 of Nislick Arthur et al. and US patent no 4,738,207 of Moss. Process and apparatus of Morin per fig 1 to capture and recover CO<sub>2</sub> and SO<sub>2</sub> by combustion of petroleum residue/coal (in boiler 5) and heat treating in reactor 14 discloses most limitations of claims 1 and 17 except for a split feeder of the fuel, feeding CaCO<sub>3</sub> to the reactor/calciner and feeding solid CaSO<sub>4</sub> to the reactor from the combustor. The reactor 14 is acting as a calciner as it decomposes carbonates into oxides and drying off water without melting the compound per its definition. Morin discloses a process for the combustion of a carbonaceous fuel 4 having a high carbon content, a relatively high sulfur content and a low ash content, which comprises (refer compositions of petroleum

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coke in dependent claims): (a) a flow of carbonaceous fuel/air line 4 (of fuel/coal line 2) having a particle size compatible (about 100 microns from grinder 1) with combustion 5 in a circulating fluidized bed (see abstract and col 1, lines 7-10, fig 1); (b) transferring fuel 4 to a pressurized fluidized bed in combustor 5 and carbonator (PFBC/C); (c) combusting the fuel line 4 flow in the PFBC/C in the presence of air line 3 and in the presence of limestone/calcium oxide line 7; (d) recovering a flue gas flow containing solids line 12 including calcium carbonate and calcium sulphate from the PFBC/C 5; (e) separating the solids 12 from the flue gas flow 7'; (f) feeding proportion of the fuel/coal via line 15 to a reactor/calciner 14; (g) combusting the proportion of the flow of fuel in the calciner in the presence of both enriched oxygen-air (see col 2, lines 22-23 for oxygen enriched air) and the solids 25 flow separated in step (e) to convert the calcium carbonate in the solids flow into calcium oxide and carbon dioxide gas; (h) recovering a flow of carbon dioxide gas from the reactor/calciner 15 via line 24; (i) recovering a flow of solids from the reactor/calciner 14 including the calcium oxide generated in the calciner via line 24; (j) transferring the flow of solids via line 28 obtained in step (i) to the PFBC/C 5 to provide the calcium oxide required in step (c). The patent of Morin does not disclose a split feeder which can proportionately feed the fuel/coal between the PFBC/C and the reactor. Tencati discloses a flow regulator R having a split feeder/manifold D coupled with positive displacement motors (M1,2,3,4,5) associated with each user (U1,2,3,4) coupled mechanically so as to distribute the fuel (like coal, oil) either equally or in any other proportion/ratio (refer page, lines 5-10). It would be also a choice in design per MPEP 2144.04 about how much proportion of fuel/coal is required

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by the process to split fuel between two users. It would be obvious to a person of ordinary skill in the art at the time invention was made to provide such split feeder to Morin in view of Tencati's feeder and also per design choice so as to get a major portion of fuel to the boiler and a minor proportion of fuel to the reactor from the same fuel line using split feeder. Moreover, Morin does not disclose a separate feed line of  $\text{CaCO}_3$ /limestone for the reactor/calciner for doing calcination. A calcinator per Wiktionary is defined as "to heat something without melting in order to drive off water and to decompose carbonates into oxides (or to oxide) or reduce it; especially to heat limestone to form quicklime". The method and apparatus of Moss discloses fresh calcium carbonate line to be feed to the reactor 12 (see col 7, lines 28-38). With teaching reference of Moss to provide such fresh limestone(  $\text{CaCO}_3$ ) to the reactor of Morin, it would be obvious to consider the reactor of Morin to be used as a calcinator/calciner so as to capture sulfur from fuel to form  $\text{CaS}$  ( oxidized to  $\text{CaSO}_4$ ) in oxygen bed and also get balance of solid within the process. Moreover, WIPO publication of Nislick et al discloses solid  $\text{CaSO}_4$  produced from the combustion of Coal/Limestone/air in the boiler 10 is transferred to the reactor/regenerator 12 per fig 1 and it would be obvious to modify the combustor of Morin to transfer  $\text{CaSO}_4$  from the boiler to the reactor/calciner in view of Nislick.

4. Claims 2-8 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morin, Tencati, Moss and Nislick as applied to claim1 above, and further in view of US patent no 4,015,977 of Crawford.

For claims 2-4, 7-8 and 13-15, neither Morin nor Moss (nor Tencati nor Nislick)

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discloses the compositions of petroleum residue/coal used for combustion and calcination. Crawford discloses a fluid petroleum coke's chemical composition per example 7 ( col 9, lines 35-45) having fixed carbon of 77.1% and per example 1 of Philips Petroleum Refinery (col 5, lines 28-43) having low ash content of 0.62% and higher sulfur content of 1.44% by weight. It would be obvious to get carbon content of less than 85% ( or about 83% or between 80-85%) by weight depends upon underground moisture, mesh size and other residual compositions within coke. It would be obvious to a person of ordinary skill in the art to provide such carbon content in petroleum coke to Morin in view of Crawford so as to get optimum carbon content for standardizing the combustion process. Also to get ash content of less than about 3% ( less than 1%) and sulfur content of about 3-6% ( or less than 10% or about 4%) by weight to Morin would be obvious to a person of ordinary skill per research and analysis of Philips Petroleum Refinery of Crawford. The petroleum coke can be upgraded and converted into forms which are useful for calcining ( see col 2, lines 20-40).

For claims 5-6, Morin discloses the fuel to be carbonaceous like coal or petroleum residue/coke where as Moss discloses the burning fuel to be also of oil, gas or coal.

For claims 9-12, Morin discloses a pressure measurement device 30 per fig 1 for the boiler 5 and both the boiler 5 (PFBC/C) and the calciner/reactor 14 can to be operated at a pressure or at atmospheric/ambient pressure or at pre-establish pressure and it is obvious to consider to operate at about 15-20 bar pressure.

For claim 16, as applied to claim 1 above, Tencati discloses the fuel spilt feeder

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D per fig 1 which can vary the feed proportion of fuel and it would be obvious to a person of ordinary skill in the art to allow the major to minor proportion of same fuel feed to a ratio of 2:1 to feeder of Morin in view of Tencati so that a desirable ratio fuel can pass through the feeder in boiler as well as to the reactor so as to get optimization in fuel combustion by weight ratio.

### ***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The patents and publications of Morin, Moss, Tencati and Nislick disclose the current state of the art in an in-situ capture of CO<sub>2</sub> and SO<sub>2</sub> in a fluidized bed combustor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NIKHIL MASHRUWALA whose telephone number is (571)270-3519. The examiner can normally be reached on Monday thru Friday- 7:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven McAllister can be reached on 571-272-6785. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nikhil Mashruwala/  
Examiner, Art Unit 3749

/Steven B. McAllister/  
Supervisory Patent Examiner, Art Unit 3749